Citation:

Schulz M, Liese AD, Fang F, Gilliard TS, Karter AJ. Is the association between dietary glycemic index and type 2 diabetes modified by waist circumference? *Diabetes Care.* 2006 May; 29(5): 1,102-1,104.

PubMed ID: 16644644

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To evaluate the impact of dietary glycemic index and glycemic load (specifically relative to abdominal obesity and waist change) on risk of type 2 diabetes in the multi-ethnic Insulin Resistance Atherosclerosis Study (IRAS).

Inclusion Criteria:

- Free of diabetes at baseline
- Returned for the folllow-up examination
- No missing data relavent to the analysis.

Exclusion Criteria:

Subjects diagnosed with type 2 diabetes at baseline or taking hypoglycemic drugs.

Description of Study Protocol:

Recruitment

More than 1,600 subjects were recruited at four clinical centers between 1992 and 1994, aiming for equal representation across:

- Glucose tolerance status (normal, impaired glucose tolerance and non-insulin-taking type 2 diabetes)
- Ethnicity (African American, Hispanic and non-Hispanic white)
- Sex
- Age (40 to 49, 50 to 59, 60 to 69 years).

Design

Prospective cohort with follow-up at five years.

Dietary Intake/Dietary Assessment Methodology

Habitual dietary intake was assessed by using a one-year, semi-quantitative, 114-item food-frequency interview.

Statistical Analysis

- Multiple logistic regression was used to assess the association between glycemic index and glycemic load and risk of type 2 diabetes
- Parameter estimates and corresponding P-values were computed for continuous variables and odds ratios for glycemic index and glycemic load tertiles
- Models were stratified by abdominal obesity at baseline and change in waist circumference during follow-up.

Data Collection Summary:

Timing of Measurements

Baseline (recruitment between 1992 and 1994) and at five-year follow-up.

Dependent Variables

Type 2 diabetes: Met World Health Organization (WHO) criteria for diabetes on follow-up oral glucose tolerance test (OGTT) or who where taking hypoglycemic medication not previously reported at baseline.

Independent Variables

- Glycemic index
- Glycemic load.

Control Variables

- Age
- Ethnicity
- Clinic
- Baseline body mass index (BMI)
- Family history of diabetes
- Smoking status
- Glucose tolerance status
- Education
- Energy intake.

Baseline waist circumference.

Description of Actual Data Sample:

- *Initial N:* Over 1,600 participants recruited for the original study
- *Attrition (final N):* 892

- *Age:* 40 to 69 years
- *Ethnicity:* Equal representation across ethnicities (African American, Hispanic, non-Hispanic white)
- *Location:* United States.

Summary of Results:

Multivariable-adjusted Odds Ratios (95% CI) for the Association Between Baseline Dietary Glycemic Index and Glycemic Load and the Risk of Developing Type 2 Diabetes, Stratified by Abdominal Obesity at Baseline and Change in Waist Circumference During Follow-up (N = 892)

Glycemic Index	First Tertile	Second Tertile	Third Tertile	P-value
Abdominal obesity[a,b]				
Yes	1.00	0.82 (0.39, 1.72)	0.84 (0.40, 1.79)	0.65
No	1.00	1.42 (0.68, 2.97)	1.90 (0.89, 4.00)	0.10
Change in waist[c,d]				
Decrease	1.00	##	##	
Stable	1.00	0.85 (0.30, 2.42)	0.49 (0.14, 1.66)	0.25
Increase	1.00	1.32 (0.65, 2.65)	1.70 (0.84, 3.47)	0.14
Glycemic load	**First Tertile**	**Second Tertile**	**Third Tertile**	**P-value**
Abdominal obesity[a,b]				
Yes	1.00	1.20 (0.58, 2.48)	0.82 (0.39, 1.75)	0.89
No	1.00	1.31 (0.67, 2.57)	1.14 (0.57, 2.26)	0.66
Change in waist[c,d]				
Decrease	1.00	##	##	
Stable	1.00	##	##	
Increase	1.00	0.81 (0.43, 1.53)	0.76 (0.39, 1.49)	0.42

[a] Waist circumference more than 102cm for males and more than 88cm for females.

[b] Adjusted for age, ethnicity/clinic, baseline BMI, family history of diabetes, smoking status, glucose tolerance status, education and energy intake (by residual method).

[c] Decrease: change in waist more than -2cm; stable: change in waist plus or minutes 2cm; increase: change in waist more than 2cm.

[d] Adjusted for age, ethnicity/clinic, baseline BMI, baseline waist circumference, family history of diabetes, smoking status, glucose tolerance status, education and energy intake (by residual method).

##: No estimates because there were less than 10 subjects.

Key Findings

- Glycemic index and glycemic load were not associated with risk of type 2 diabetes in unstratified multivariate regression models (glycemic index: beta = 0.0234, P=0.2; glycemic load: beta = -0.0018, P=0.6)
- Among non-abdominally obese subjects, diabetes risk was elevated by 12% (OR: 1.12; 95% CI: 1.03, 1,21) for a one-unit increase in glycemic index among persons with a waist increase and no abdominal obesity.

Author Conclusion:

- A high glycemic index diet predicts type 2 diabetes risks among non-abdominally obese individuals and individuals with increases in waist, but not among abdominally obese individuals
- There was no association apparent for dietary glycemic load or carbohydrate intake.

Reviewer Comments:

Author-identified potential limitations:

- *Small sample size*
- *Incident cases may explain, in part, non-significant risk estimates.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes

1.3.	Were the target population and setting specified?	N/A
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	No
2.4.	Were the subjects/patients a representative sample of the relevant population?	N/A
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	???
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A

5.	**Was blinding used to prevent introduction of bias?**	???
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	???
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes

7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	N/A
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes